REMARKS

Claims 1, 2 and 4-7 remain in the application.

Claims 1, 2 and 5-7 stand rejected under 35 U.S.C. §102(a) for obviousness over U.S. Patent No. 6,673,150 to Garibin et al. in view of U.S. Patent No. 6,740,159 to Kandler et al. and U.S. Application No. 2002/016650 to Yogo et al. Claims 1, 2 and 4-7 stand rejected under 35 U.S.C. §103(a) for obviousness over U.S. Application No. 2001/0025598 to Staeblein et al. Claims 1, 2 and 4-7 stand rejected under 35 U.S.C. §103(a) for obviousness over U.S. Patent No. 6,309,461 to Ginoulakis et al. in view of the Kandler patent. In view of the amendment to claim 1 and for the following reasons, claims 1, 2 and 4-7 are believed to define over the prior art of record and be in condition for allowance.

The present invention is directed to an as-grown single crystal of calcium fluoride that is obtained by a single crystal pulling method in a non-annealed state. The straight barrel part of the crystal has a diameter of at least 17 cm and a length of at least 8 cm. The crystal is not annealed, yet exhibits birefringence of not more than 3 nm/cm. Claim 1 has been amended to specify that the as-grown single crystal is non-annealed and that the birefringence of not more than 3 nm/cm is in this non-annealed state. Support for this amendment to claim 1 can be found at least at page 7, lines 9-15. As detailed below, the rejections of claims 1, 2 and 4-7 should be withdrawn in view of the amendment to claim 1 which excludes therefrom crystals that are annealed in order to achieve certain properties including low birefringence.

In particular, the rejection of claims 1, 2 and 5-7 over the combined teachings of Garibin, Kandler and Yogo relies on the Garibin patent for disclosing a calcium fluoride crystal having a diameter of 30 cm, length of 7 cm and a birefringence of 1-3 nm/cm. However, as noted in the Office Action, the Garibin patent fails to disclose a crystal that is over 7 cm long while still having a low birefringence. To account for this deficiency, the Office Action selects certain disclosure from other references as indicating motivation to modify the Garibin process and crystal produced thereby. The Kandler patent is relied upon for its teaching to make a calcium fluoride crystal via a melting and solidifying process to

produce a crystal that is 25 cm in diameter. The Office Action relies on the Yogo application for disclosing annealing of a calcium fluoride single crystal to lower its birefringence. However, claim 1 has been amended to specify that the claimed as-grown single crystal of calcium fluoride is non-annealed and that the birefringence of not more than 3 nm/cm is in the non-annealed state. Nowhere does this combination of references teach or suggest an as-grown single crystal which is in a non-annealed state, yet includes a birefringence of not more than 3 nm/cm and has a straight barrel part of at least 17 cm in diameter and at least 8cm long. None of these references teach or suggest an as-grown crystal having the claimed low birefringence and the claimed dimensions. A crystal produced via a single crystal pulling process having low birefringence (3 nm/cm or less) and sized at least 17 cm in diameter and 8 cm in length (for the straight barrel portion) is not suggested by these various references. The Office Action asserts that certain features of crystals produced via a Bridgman-Stockburger (BS) method can be simply selected to produce the claimed crystal. Nothing in Garibin suggests that a pulled crystal sized as in Kandler (20 cm or more) would have low birefringence. The opportunity to produce large diameter crystals in a BS method (per Kandler) or to anneal so as to create low birefringence (per Yogo) does not indicate it would be obvious to convert the BS method of Garibin to a crystal pulling method, produce the claimed dimensions and exhibit low birefringence. Accordingly, claims 1, 2 and 5-7 define over the combined teachings of Garibin, Kandler and Yogo.

The Staeblein patent is likewise directed to a method of producing a single crystal by tempering a crystal which may be sized 30 cm in diameter and 60 cm in length. The application indicates at paragraph 18 that birefringence can be reduced and/or eliminated when the finished single crystal is heated to over 1150°C. As such, the Staeblein patent requires a form of annealing in order to achieve the low birefringence. In contrast, claim 1 is directed to a non-annealed single crystal of calcium fluoride having a birefringence in its non-annealed state of not more than 3 nm/cm that is not taught or suggested by the Staeblein application. The Staeblein application is limited to teaching high temperature treatment in order to achieve low birefringence. In contrast, the single crystal of the present invention has

the structure of a non-annealed crystal with low birefringence of not more than 3 nm/cm. Accordingly, claims 1, 2 and 4-7 define over the Staeblein application.

The rejection of claims 1, 2 and 4-7 over the combined teachings of the Ginoulakis and Kandler patents is traversed for similar reasons. In particular, the Ginoulakis patent discloses an annealed crystal. The teaching in Kandler of the desirability of producing a calcium fluoride crystal that is at least 20 cm long does not overcome the failure of Ginoulakis to disclose a crystal in its unannealed state which has the low birefringence claimed herein.

Each of the Yogo, Staeblein and Ginoulakis patent documents all relate to crystals that are annealed and have a structure and properties associated with an annealed crystal. The present invention is limited to crystals which are non-annealed. Rejections based upon these references that require annealing to achieve low birefringence are not applicable to the claims as amended. The remaining references (Garibin and Kandler patents) do not suggest a non-annealed crystal produced via a crystal pulling method having the claimed size and birefringence. Accordingly, claims 1, 2 and 4-7 are believed to define over the prior art of record and be in condition for allowance.

Respectfully submitted,

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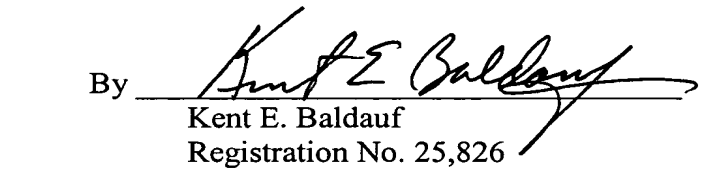
By 

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